

Specification Min of Tech CV6197 Issue 1 Dated January 1967 To be read in conjunction with K1001, Issue 6				<u>SECURITY</u> <u>Specification</u> <u>Valve</u> Unclassified Unclassified	
→ indicates a change					
TYPE OF VALVE - Electron Multiplier Photocell CATHODE - S20 ENVELOPE - Glass PROTOTYPE - VX5111				<u>MARKING</u> See K1001/4 and Note 2, Page 4.	
<u>RATINGS AND CHARACTERISTICS</u> Absolute, non-simultaneous and not for Inspection purposes				<u>BASE</u> B19A	
Absolute, non-simultaneous and not for Inspection purposes Note				<u>CONNECTIONS</u>	
				Pin	Electrode
Max. voltage between cathode and anode (V)				1	Dynode Dy1
Max. safe interstage potential (V)	300		A, B	2	" Dy3
Max. voltage between anode and Dy11 (V)	300			3	" Dy5
Max. voltage between cathode and Dy1 (V)	400			4	" Dy7
Max. safe D.C. (or average) anode current (mA)	1	C		5	" Dy9
Max. operating D.C. (or average) anode current (μA)	100	D		6	" Dy11
Max. anode dissipation (mW)	100			7	Internal Connection
Max. ambient temp. (operating) (°C)	75	E		8	Anode a
Max. ambient temp. (non-operating) (°C)	90	F		9	Internal Connection
Min. ambient temp. (operating) (°C)	-40			10	Dynode Dy10
				11	" Dy8
				12	" Dy6
				13	" Dy4
				14	" Dy2
				15	Focus F
				16	Internal Connection
				17	" "
				18	" "
				19	Cathode k
				<u>DIMENSIONS</u> See Outline Drawing Page 5.	
<u>NOTES</u>					
A. Using a dynode chain giving 100 volts, Dy10 to Dy11, and Dy11 to anode, and a uniform interstage potential difference for the remaining dynode stages. The focus(F) potential shall be set so that:					
$V_{(k-F)} = \frac{2}{3} V_{(k-Dy1)}$					
B. The normal maximum overall voltage is that printed on the tube which may be 1050, 1120, 1270, 1400. This permits safe voltage excursions up to 1280, 1380, 1480, and 1630 respectively.					
C. This current may only be drawn for a period not exceeding 5 seconds.					
D. This is the maximum current advised for reliable and repeatable measurements, free from drift due to fatigue.					
E. This is a limit above which permanent damage may occur.					
F. This temperature is restricted to a maximum period of 1 hour.					
G. The Dynode chain resistors must not exceed 2 megohms.					
H. NATO Stock Number. 5960-99-037-5253					

To be performed in addition to those tests applicable in K1001

TEST CONDITIONS Unless otherwise stated for individual test

1. Use a standard lamp source at a nominal colour temperature of 2870°K
2. Light flux incident over the centre 22 mm nominal diameter of photocathode.
3. Arrange dynode load resistance chain to give 100 volts Dy10 to Dy11, and Dy11 to anode, and a uniform interstage potential for the remaining dynode stages. The focusing electrode (F) to be at such a potential that:-

$$V(k - F) = \frac{2}{3} V(k - dy1)$$

4. Resistance between dynodes to be 15 kohm minimum and 47 kohm maximum.

K1001 Ref.	TEST	TEST CONDITIONS	Insp. Level	Limits		Units
				Min.	Max.	
5D	(a) General Inspection Dimensions	No voltages. See Drawing Page 5	100%			
5D.7.1	(b) Cathode Photo Sensitivity	Note 1	100%	130		µA/lumen
	(c) Cathode to Anode potential for Overall Sensiti- vity of 250 A/lumen nominal	Ambient temperature - 20°C ± 5°C Note 2	100%	970	1400	V
	(d) Stability (1) Note 4	Note 3 Ambient temperature - 20°C ± 5°C	100%			
	(e) Dark Current (1)	No incident light Ambient temperature - 20°C ± 5°C Overall sensitivity 250 A/lumen nominal A 2 hour ageing period is permitted.	100%		25x10 ⁻⁹	A
	(f) Spectral Response	Note 1 and 5 Adequate light (10 ⁻³ lumens approx) to give a suitable cathode current. Insert filter No.1 and measure cathode current I ₁ . Insert filter No.2 and measure cathode current I ₂ . Ratio $\frac{I_1}{I_2}$	100%	12	30	

K1001 Ref.	TEST	TEST CONDITION	Insp. Level	Limits		Units
				Min.	Max.	
	(g) Dark Current (2)	No incident light Ambient temperature $45^{\circ}\text{C} \pm 5^{\circ}\text{C}$ Overall sensitivity 250 A/lumen nominal	5%		1.25×10^{-7}	A
	(h) Stability (2) Note 4	Note 3 Ambient temperature $45^{\circ}\text{C} \pm 5^{\circ}\text{C}$	5%			
	(j) Signal/Noise Ratio	Ambient Temperature $20^{\circ}\text{C} \pm 5^{\circ}\text{C}$ Note 7	100%	30	-	dB
	(k) <u>Holding Period 7 days</u> Post Holding Tests Test (b) Test (e)		100% 100%	130	25×10^{-9}	$\mu\text{A/lumen}$ A
	(l) Stability (3) Note 4	Note 3 Ambient temperature - $75^{\circ}\text{C} \pm 5^{\circ}\text{C}$	QA			
	(m) Capacitance	Anode to all other electrodes	QA	5	8	pF
	(n) Gain characteristic factor (p) measured at a number of points in the sensitivity range 250 A/lumen to 0.05 A/lumen. Note 6.		QA	6.5	7.5	
11.2	(o) Vibration Resonance Search Anode modulation (μA peak to peak)	Frequency range 5 to 10 c/s. Acceleration 0.5g. Frequency range 10 c/s to 5 kg/s. Acceleration 2.0g. Overall voltage 1000V. Cathode illumination to give 100 μA anode current.			1	μA
11.3	(p) Vibration Fatigue	Tube inoperative. Acceleration 2g. Frequency 200 c/s nom. Total test time max. 100 hrs. At least 24 hrs. in each of three mutually perpen- dicular planes, one of which must be along the major axis of the tube. After completion repeat tests (b),(c),(d),(e) and (m)	QA			

NOTES

1. Measured with cathode 360V negative with respect to all other electrodes.
2. The overall voltage to be printed on the tube is derived as follows:-

between	970V	and	1050V	mark tube	1050V
over	1050V	and up to	1120V	mark tube	1120V
"	1120V	"	"	"	1270V
"	1270V	"	"	"	1400V
3. Increase overall voltage to a value depending on the voltage printed on the tube envelope as follows:-

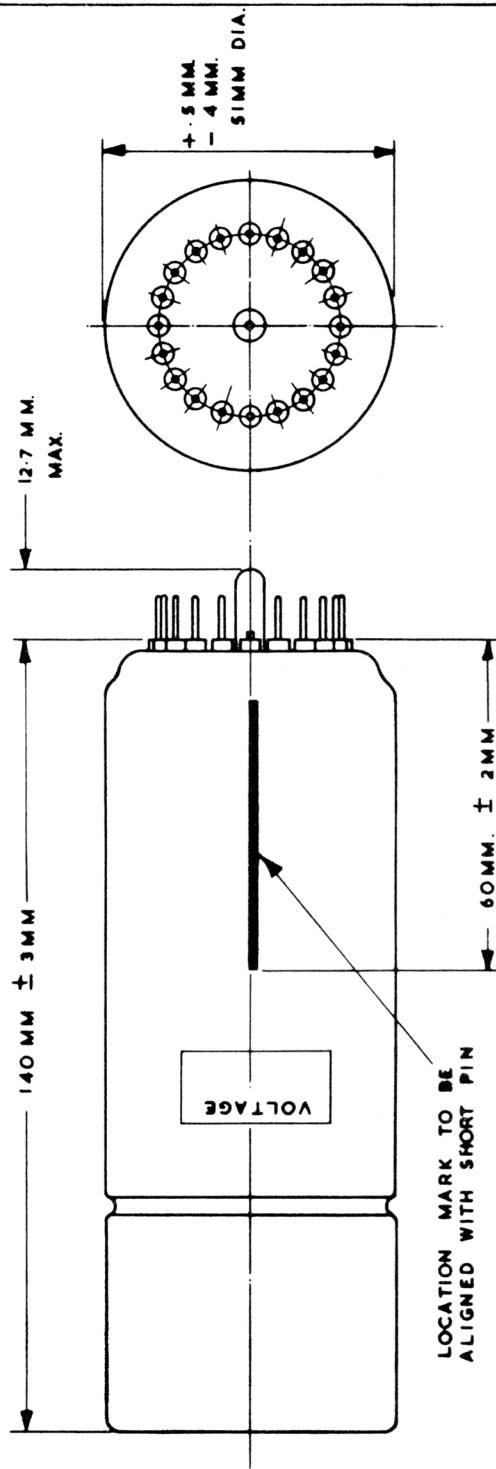
<u>Voltage printed on tube</u>	<u>Overall Voltage for Stability Test</u>
1050	1280
1120	1380
1270	1480
1400	1630

4. Stability is defined either as a condition in which the dark current versus gain characteristic is linear, or the condition in which the tube output is free from spikes or irregularities.
5. Filter No.1 shall be an Ilford 601, and Filter No. 2 shall be an Ilford 608.
6. The overall gain characteristic G shall be such that G is proportional to V^D where V = interdynode potential of Dy1 to Dy10.
7. With a luminous flux of 0.5 ± 0.05 μ lumen falling on a photocathode area defined by a mask with an aperture of 15.9 ± 0.25 mm diameter, the overall voltage shall be adjusted until the anode current of the photo-multiplier reaches a value of 5.8 ± 0.3 μ A.

The r.m.s. value of the noise current, measured after filtering to an effective bandwidth of 105 kc/sec., shall not exceed 0.210 μ A. The effective bandwidth is defined by:-

$$\Delta f = \int_0^{\infty} (\text{Relative filter response})^2 df$$

OUTLINE DRAWING
(THIRD ANGLE PROJECTION)



VOLTAGE MARKING
SEE NOTE 2 PAGE 4